DOCUMENT RESUME

ED 441 300 EC 307 816

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TITLE AAC Language Activity Monitoring: Entering the New Millennium.
PUB DATE 1999-10-00
NOTE 7p.; Paper presented at the Annual Southeast Augmentative Communication Conference (20th, Birmingham, Alabama, October 1-2, 1999).
PUB TYPE Reports - Descriptive (141) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Adults; *Augmentative and Alternative Communication; Children; *Communication Disorders; *Disabilities; *Evaluation Methods; *Language Acquisition; *Language Skills; Vocabulary Development

ABSTRACT

This report describes how augmentative and alternative communication (AAC) automated language activity monitoring can provide clinicians with the tools they need to collect and analyze language samples from the natural environment of children with disabilities for clinical intervention and outcomes measurements. The Language Activity Monitor (LAM) is described as a recording device that can be attached and connected to any AAC system with an RS-232c serial data output. The LAM records each output (one or more letters, words, phrases, sentences, etc.) from the AAC system and attaches a time stamp. The report discusses how the LAM function has been implemented in a new AAC device and as an add-on module for existing devices, and how the recorded data can periodically be uploaded into a computer for editing and analysis. The processing of raw LAM data and analyzing LAM data are addressed. The ways in which LAM tools support the analysis of augmented communicator's production of linguistic structures, vocabulary diversity, and communication rate are emphasized. (Contains 13 references.) (CR)

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AAC LANGUAGE ACTIVITY MONITORING: ENTERING THE NEW MILLENIUM

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AAC automated language activity monitoring (LAM) provides clinicians with tools needed to collect and analyze language samples from the natural environment for clinical intervention and outcomes measurement. The LAM function has been implemented in a new AAC device and as an add-on module for existing devices. Periodically the recorded data can be uploaded into a computer for editing and analysis. LAM tools support the analysis of augmented communicator's production of linguistic structures, vocabulary diversity, and communication rate. LAM is moving AAC from an art to a science. This initiative has been approved for funding by the National Institutes of Health.

INTRODUCTION

Communication is a skilled, turn-taking activity requiring the exchange of ideas and information between a speaker and a listener (McCormick & Schiefelbusch, 1990). Since the emergence of the field of AAC, professionals, family members and consumers have agreed that the desire to communicate is the primary reason for using an AAC system. In fact, the goal for AAC is to provide the system and services that result in the highest level of personal achievement for the people who can benefit from the use of an AAC system (Hill & Romich, in press). Little research is available based on the actual communication of people who rely on AAC. Further, the AAC clinical intervention process seldom takes into consideration the use of the AAC system between periodic therapy sessions. Conventional methods of monitoring AAC system use are based on personal observation and video or audio recording with subsequent observation, timing, and/or transcription. The cost of this approach is high because of the human time investment. Consequently, professionals seldom collect data on the actual daily environmental use of AAC systems by consumers.

Determining the effectiveness of clinical intervention requires evidence. With few, if any, exceptions, clinicians providing services to people who rely on AAC have not had the luxury of time necessary to obtain language samples from actual use of the AAC system in the natural environment. The obvious solution to this situation is the automation of the language data collection and analysis processes. There have been some efforts made in this area, all integral to specific communication or writing systems (Miller, et.al., 1990; Ahlsen & Stromqvist, 1999; Copestake & Flickinger, 1999). Some commercially available AAC devices have included

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limited features that monitor use, but until now none have incorporated time information. Romich and Hill (1999) are in the process of developing and testing the LAM device for AAC devices with synthesized speech. In addition, the LAM function has been added as a feature to the AXS1600 manufactured by Prentke Romich Company (PRC). The use of the LAM device and function provides clinicians with a starting set of tools to collect and analyze performance data to support clinical intervention and measure outcomes.

LANGUAGE ACTIVITY MONITOR

The Language Activity Monitor (LAM) is a recording device that can be attached and connected to any AAC system with an RS-232c serial data output. The LAM records each output (one or more letters, words, phrases, sentences, etc.) from the AAC system and attaches a time stamp. The data stored in the LAM over time is then periodically uploaded to a computer for analysis. This uploading process can happen without custom computer software so that the data can be transmitted as an email attachment or saved on a floppy disk for transmission or transport to a different location for analysis. The protocol for data recording and uploading includes a number of commands and features to deal with enabling and disabling recording, identifying non-language information and time stamps, and setting the clock. Push buttons and an indicator on the LAM make it easy to enable and disable recording manually, as may be desired during therapy sessions and other times when recording could skew results.

Language Activity Monitor (LAM) device under development by Prentke Romich Company, the University of Pittsburgh, and Edinboro University of Pennsylvania.

INTERNAL LAM FUNCTION

The LAM has been added as an internal function to the software for the AXS1600. In order to accumulate language data, you must turn *Data Logging On* in the MAINTENANCE menu before you start procedures to collect the language sample. The LAM software will record all language activity after you turn on the data logging function. Once you have collected the language data you will need to upload this raw LAM data to another computer for editing and analysis.

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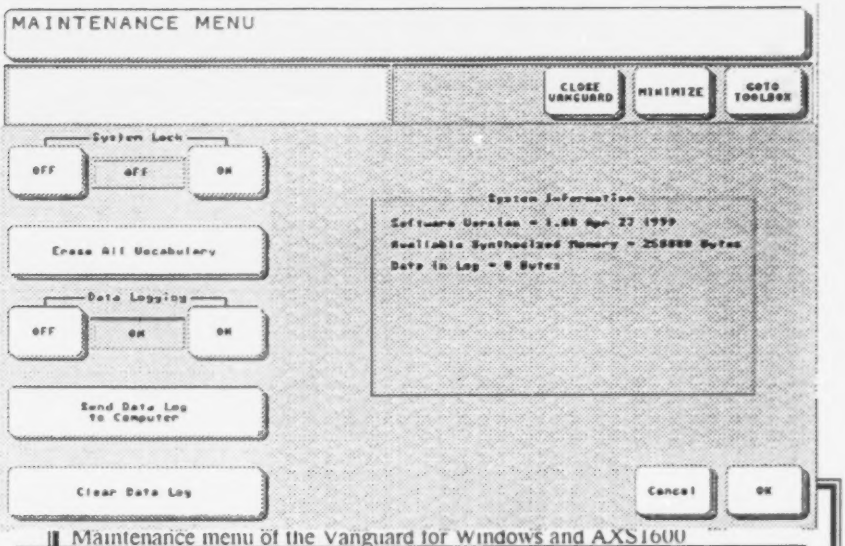

Maintenance menu of the Vanguard for Windows and AXS1600

Language Activity Monitor (LAM) function located on the Maintenance menu of the AXS1600.

PROCESSING RAW LAM DATA

The raw LAM data must be uploaded into a computer for editing and analysis. Presently, the raw LAM data is being uploaded into a computer running the HyperTerminal program which is part of Windows. The use of a standardized reporting protocol provides for universal compatibility with computer-based applications (Hill & Romich, 1999). Below is an example of the how the raw LAM data looks once uploaded into HyperTerminal:

20:37:00 "I need "
20:37:05 "*[VOLUME UP] * "
20:37:06 "*[VOLUME UP]* "
20:37:07 "*[VOLUME UP]* "
20:37:14 "something "
20:37:16 "to drink "
20:37:19 "i"
20:37:20 "m"
20:37:24 "m"
20:37:28 "ediately "

Once the raw LAM data is in HyperTerminal the text can be copied, pasted and edited in a word processing document. The final product is a language transcript that can be used for analysis. The above example would look as follows after being edited:

I need something to drink immediately.

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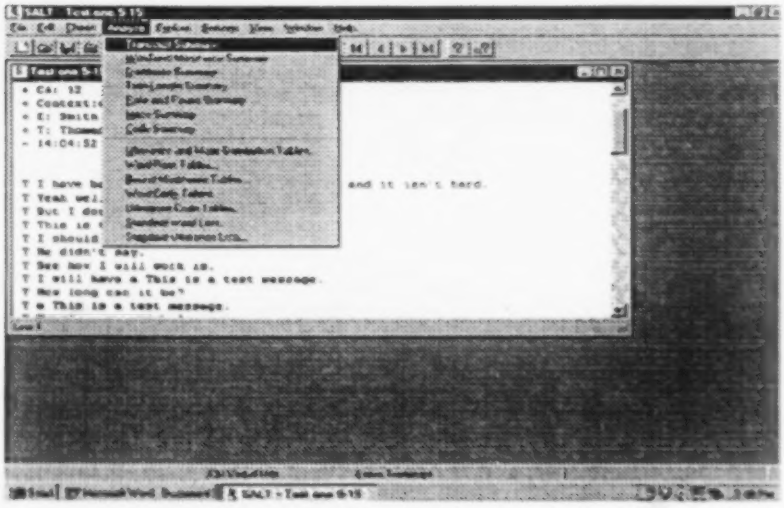
One important issue in the use of any recording device is privacy. For people who are able to do so, the serial output of the AAC system can be turned off. Also, the recording protocol provides for enabling and disabling the recording process using specific character string commands. It is strongly recommended that people whose communication is being monitored be clearly informed and that public use of recorded communication be anonymous. The LAM report header starts with the warning:

***** CAUTION! *****
The following data represents personal communication.
Respect privacy accordingly.

ANALYZING LAM DATA

After LAM data is uploaded into the computer and the raw data has been edited, the text is analyzed using standard and/or custom vocabulary and language analysis software applications. Various parameters to be analyzed could include:

- vocabulary diversity
- frequency counts
- spelling versus whole word access
- morphological usage
- lexical or semantic usage
- syntactic structures
- developmental levels



Screen capture showing Menu bar from Systematic Analysis of Language Transcripts (SALT) used to select analysis procedures for language transcripts.

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The LAM pilot study has used the Systematic Analysis of Language Transcripts (SALT) as the analysis software application (Miller, 1983). The time required to upload, edit, and analyze a two hour language sample of over 100 utterances from a high-end user takes approximately 15-20 minutes using these procedures. Simpler analysis, such as word searches, may take only a few minutes. The development of LAM tools to support editing and analysis will reduce analysis time, significantly.

To satisfy needs other than those addressed by standard language analysis programs it may be necessary to develop custom applications or use manual methods to analyze the LAM data. Examples of this could be analysis of use of particular vocabulary items since the previous therapy session, calculation of communication rate using the time stamps, methods used for language representation (spelling vs. words and phrases), and error rates and types.

SUMMARY

Current best practice in AAC implementation emphasizes communication outcomes based on a team selecting outcomes from a functional curriculum model (Blackstone, 1990; Hill, 1996; Gray, 1998). AAC outcomes can be determined by noting positive changes in the attitudes of teachers, classmates, co-workers and others toward the consumer (Calculator, 1998). However, the tools described here provide more objective data to analyze systematically the scope and sequence of expected AAC outcomes. Clinicians using LAM tools will be able to document daily use of targeted vocabulary and language representation methods thus facilitating the intervention process across environments and team members. In particular, the team will have the instrumentation to develop and monitor Individual Education Program (I.E.P.) goals and objectives. The team will not only be able to quantify the I.E.P. objectives, but will be able to qualify the implementation strategies and techniques used to facilitate AAC system use.

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